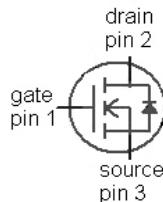
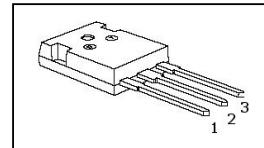


**CoolMOS™ Power Transistor**
**Product Summary**
**Features**

- Worldwide best  $R_{ds(on)}$  in TO247
- Low gate charge
- Extreme dv/dt rated
- High peak current capability
- Qualified according to JEDEC<sup>1)</sup> for target applications
- Pb-free lead plating; RoHS compliant

$V_{DS}$	650	V
$R_{DS(on),max}$	0.07	$\Omega$
$Q_{g,typ}$	255	nC

**PG-T0247-3-1**


Type	Package	Marking
SPW47N65C3	PG-T0247-3-1	47N65C3

**Maximum ratings, at  $T_j=25^\circ\text{C}$ , unless otherwise specified**

Parameter	Symbol	Conditions	Value	Unit
Continuous drain current	$I_D$	$T_C=25^\circ\text{C}$	47	A
		$T_C=100^\circ\text{C}$	30	
Pulsed drain current <sup>2)</sup>	$I_{D,pulse}$	$T_C=25^\circ\text{C}$	141	
Avalanche energy, single pulse	$E_{AS}$	$I_D=3.5\text{ A}$ , $V_{DD}=50\text{ V}$	1800	mJ
Avalanche energy, repetitive $t_{AR}^{2,3)}$	$E_{AR}$	$I_D=7\text{ A}$ , $V_{DD}=50\text{ V}$	1	
Avalanche current, repetitive $t_{AR}^{2,3)}$	$I_{AR}$		7	A
MOSFET dv/dt ruggedness	dv/dt	$V_{DS}=0\ldots480\text{ V}$	50	V/ns
Gate source voltage	$V_{GS}$	static	$\pm 20$	V
		AC ( $f>1\text{ Hz}$ )	$\pm 30$	
Power dissipation	$P_{tot}$	$T_C=25^\circ\text{C}$	415	W
Operating and storage temperature	$T_j$ , $T_{stg}$		-55 ... 150	°C
Mounting torque		M3 and M3.5 screws	60	Ncm

Maximum ratings, at  $T_j=25\text{ }^\circ\text{C}$ , unless otherwise specified

Parameter	Symbol	Conditions	Value	Unit
Continuous diode forward current	$I_S$	$T_c=25\text{ }^\circ\text{C}$	47	A
Diode pulse current <sup>2)</sup>	$I_{S,pulse}$		141	

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	

### Thermal characteristics

Thermal resistance, junction - case	$R_{thJC}$		-	-	0.3	K/W
Thermal resistance, junction - ambient	$R_{thJA}$	leaded	-	-	62	
Soldering temperature, wavesoldering only allowed at leads	$T_{sold}$	1.6 mm (0.063 in.) from case for 10 s	-	-	260	°C

Electrical characteristics, at  $T_j=25\text{ }^\circ\text{C}$ , unless otherwise specified

### Static characteristics

Drain-source breakdown voltage	$V_{(BR)DSS}$	$V_{GS}=0\text{ V}$ , $I_D=250\text{ }\mu\text{A}$	650	-	-	V
Gate threshold voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}$ , $I_D=2.7\text{ mA}$	2.1	3	3.9	
Zero gate voltage drain current	$I_{DSS}$	$V_{DS}=600\text{ V}$ , $V_{GS}=0\text{ V}$ , $T_j=25\text{ }^\circ\text{C}$	-	0.5	25	$\mu\text{A}$
		$V_{DS}=600\text{ V}$ , $V_{GS}=0\text{ V}$ , $T_j=150\text{ }^\circ\text{C}$	-	50	-	
Gate-source leakage current	$I_{GSS}$	$V_{GS}=20\text{ V}$ , $V_{DS}=0\text{ V}$	-	-	100	nA
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS}=10\text{ V}$ , $I_D=30\text{ A}$ , $T_j=25\text{ }^\circ\text{C}$	-	0.06	0.07	$\Omega$
		$V_{GS}=10\text{ V}$ , $I_D=30\text{ A}$ , $T_j=150\text{ }^\circ\text{C}$	-	0.17	-	
Gate resistance	$R_G$	$f=1\text{ MHz}$ , open drain	-	0.75	-	$\Omega$

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	

**Dynamic characteristics**

Input capacitance	$C_{iss}$	$V_{GS}=0 \text{ V}$ , $V_{DS}=25 \text{ V}$ , $f=1 \text{ MHz}$	-	7000	-	pF
Output capacitance	$C_{oss}$		-	2300	-	
Effective output capacitance, energy related <sup>5)</sup>	$C_{o(er)}$	$V_{GS}=0 \text{ V}$ , $V_{DS}=0 \text{ V}$ to 480 V	-	270	-	
Effective output capacitance, time related <sup>6)</sup>	$C_{o(tr)}$		-	490	-	
Turn-on delay time	$t_{d(on)}$	$V_{DD}=400 \text{ V}$ , $V_{GS}=10 \text{ V}$ , $I_D=47 \text{ A}$ , $R_G=5.6 \Omega$	-	100	-	ns
Rise time	$t_r$		-	27	-	
Turn-off delay time	$t_{d(off)}$		-	210	-	
Fall time	$t_f$		-	14	-	

**Gate Charge Characteristics**

Gate to source charge	$Q_{gs}$	$V_{DD}=480 \text{ V}$ , $I_D=47 \text{ A}$ , $V_{GS}=0 \text{ to } 10 \text{ V}$	-	35	-	nC
Gate to drain charge	$Q_{gd}$		-	120	-	
Gate charge total	$Q_g$		-	255	-	
Gate plateau voltage	$V_{plateau}$		-	5.5	-	

**Reverse Diode**

Diode forward voltage	$V_{SD}$	$V_{GS}=0 \text{ V}$ , $I_F=47 \text{ A}$ , $T_j=25 \text{ }^\circ\text{C}$	-	0.9	1.2	V
Reverse recovery time	$t_{rr}$		-	640	-	
Reverse recovery charge	$Q_{rr}$		-	19	-	
Peak reverse recovery current	$I_{rm}$		-	56	-	

<sup>1)</sup> J-STD20 and JESD22

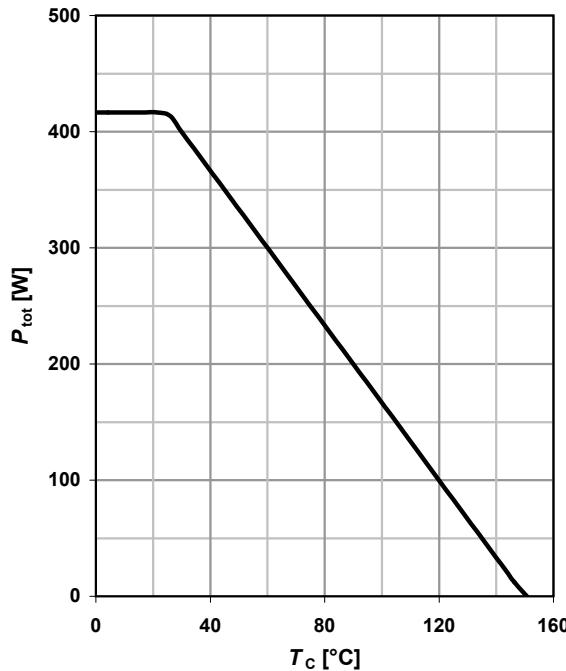
<sup>2)</sup> Pulse width  $t_p$  limited by  $T_{j,max}$ 
<sup>3)</sup> Repetitive avalanche causes additional power losses that can be calculated as  $P_{AV}=E_{AR} \cdot f$ .

<sup>5)</sup>  $C_{o(er)}$  is a fixed capacitance that gives the same stored energy as  $C_{oss}$  while  $V_{DS}$  is rising from 0 to 80%  $V_{DSS}$ .

<sup>6)</sup>  $C_{o(tr)}$  is a fixed capacitance that gives the same charging time as  $C_{oss}$  while  $V_{DS}$  is rising from 0 to 80%  $V_{DSS}$ .

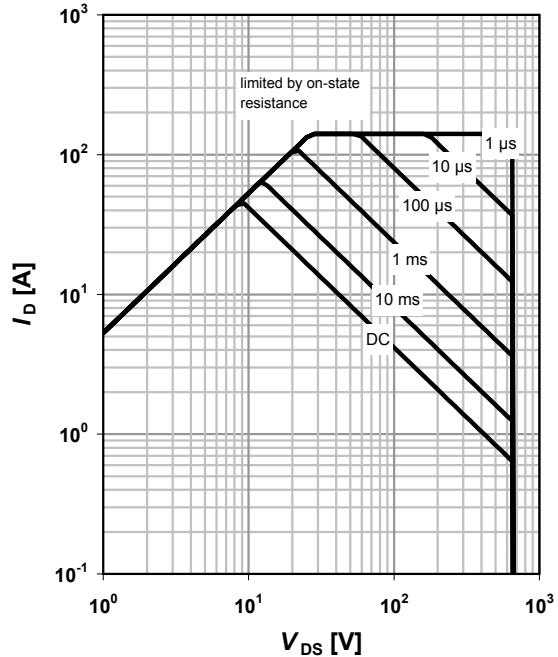
**1 Power dissipation**

$$P_{\text{tot}} = f(T_c)$$


**2 Safe operating area**

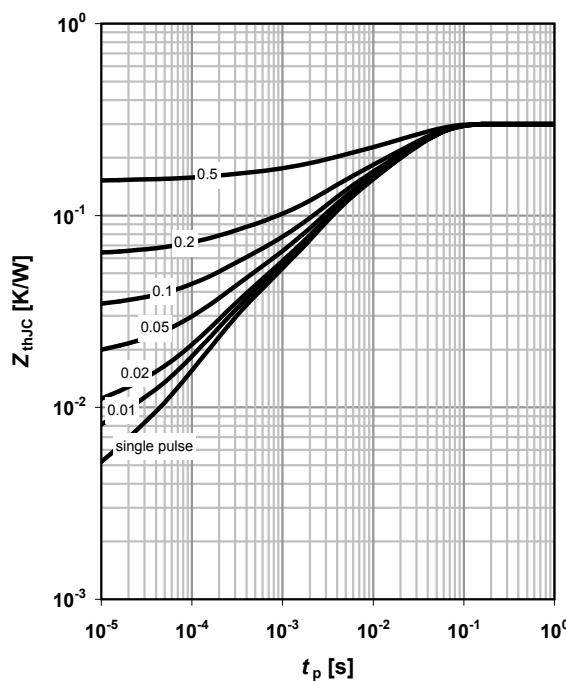
$$I_D = f(V_{DS}); T_c = 25^\circ\text{C}; D = 0$$

parameter:  $t_p$


**3 Max. transient thermal impedance**

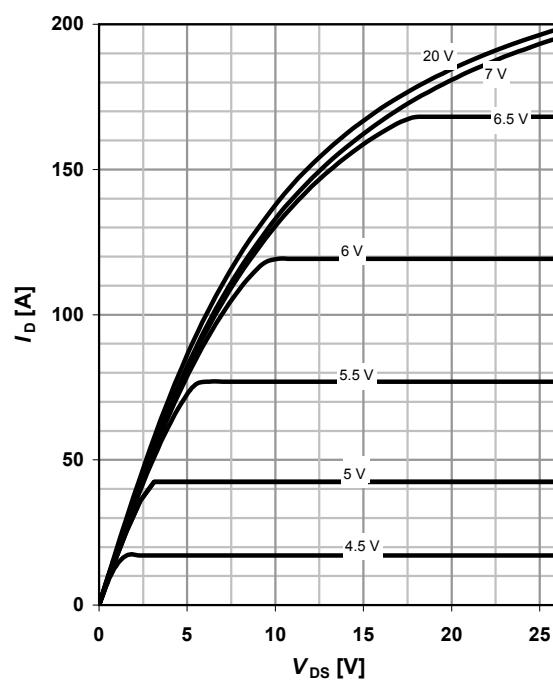
$$Z_{(\text{thJC})} = f(t_p)$$

parameter:  $D = t_p/T$

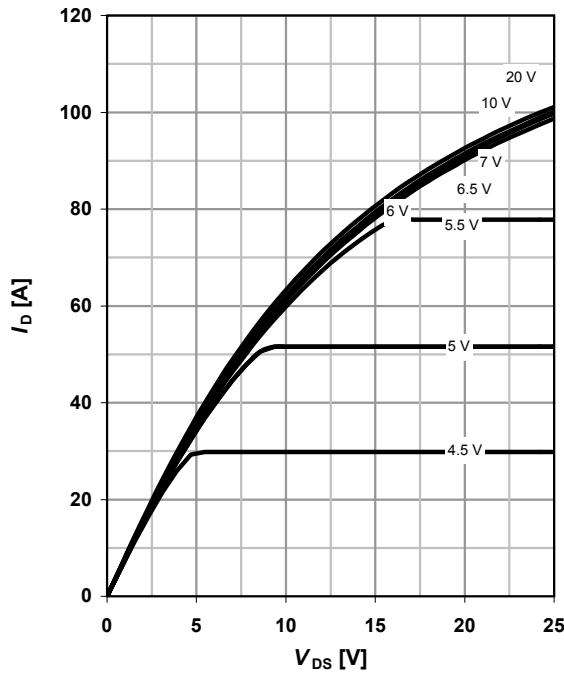

**4 Typ. output characteristics**

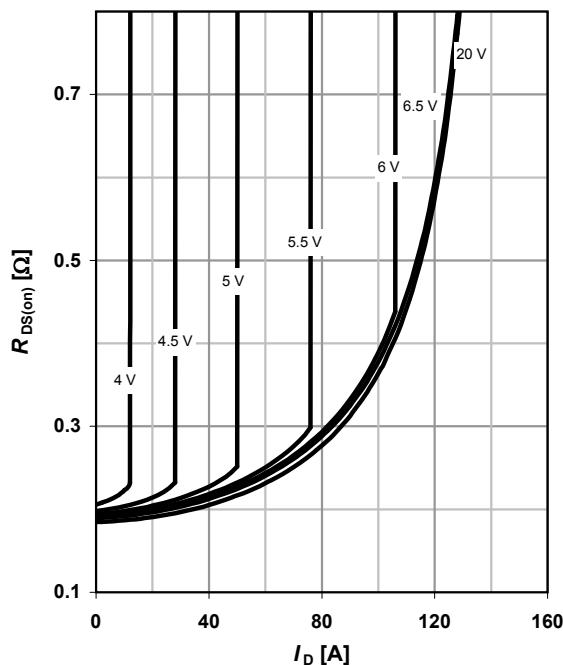
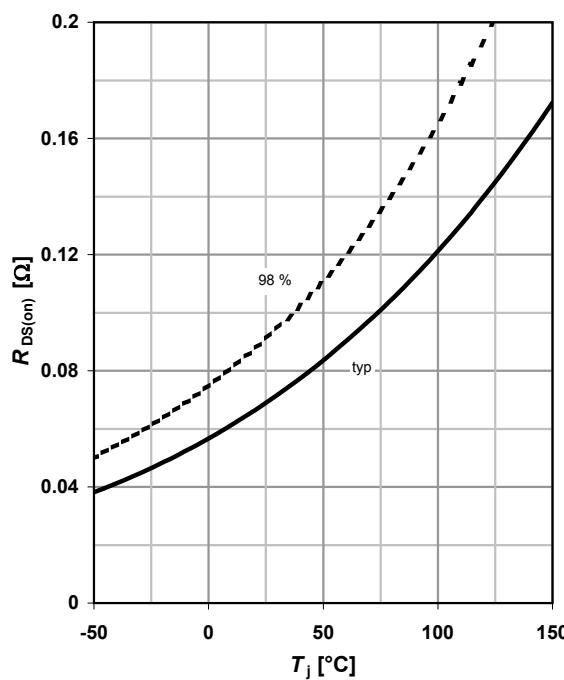
$$I_D = f(V_{DS}); T_j = 25^\circ\text{C}$$

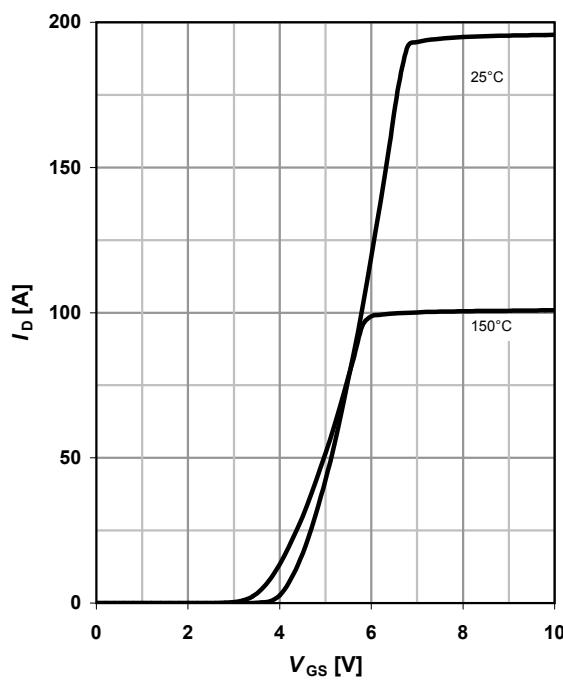
parameter:  $V_{GS}$



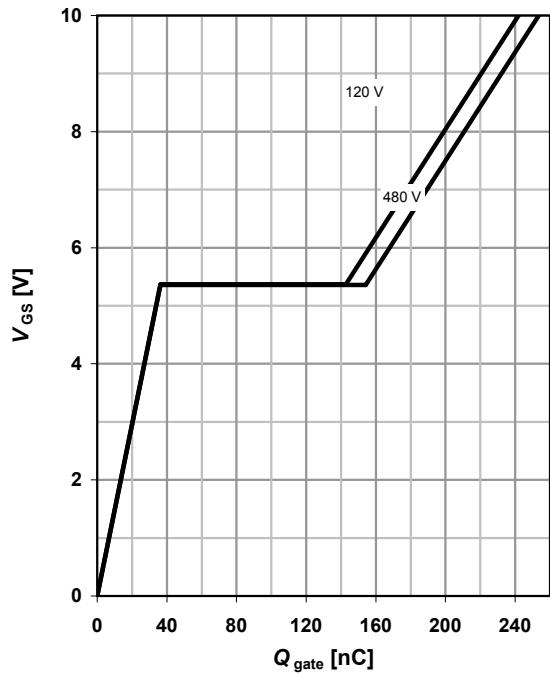
**5 Typ. output characteristics**
 $I_D = f(V_{DS})$ ;  $T_j = 150 \text{ }^\circ\text{C}$ 

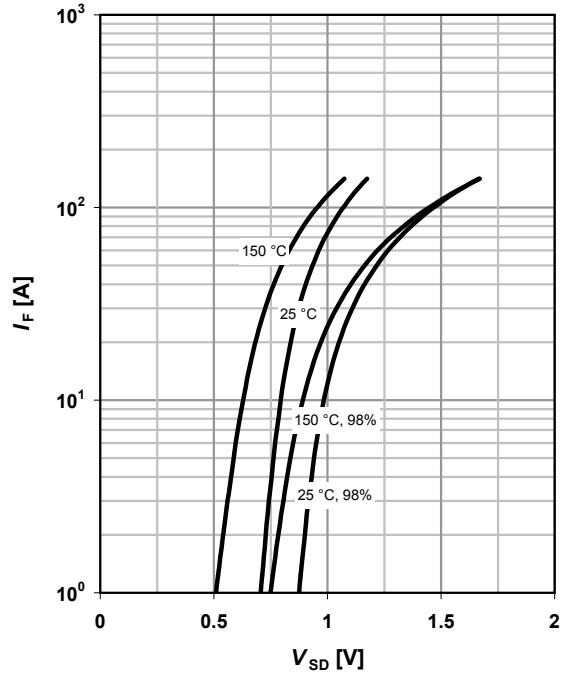
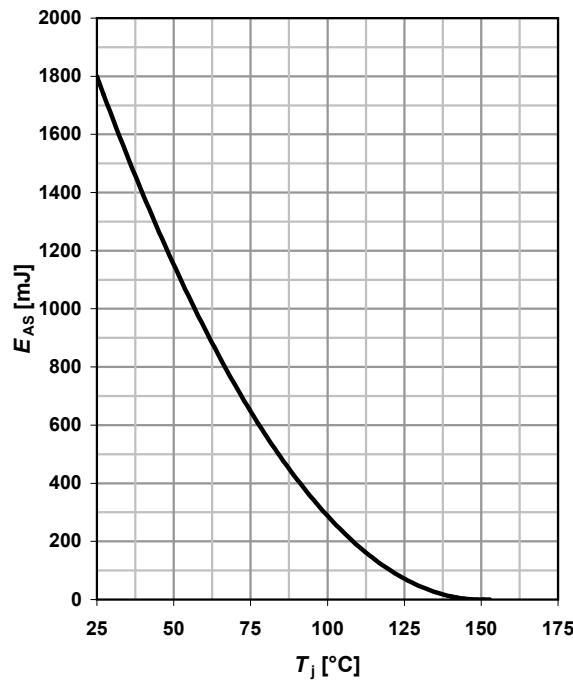
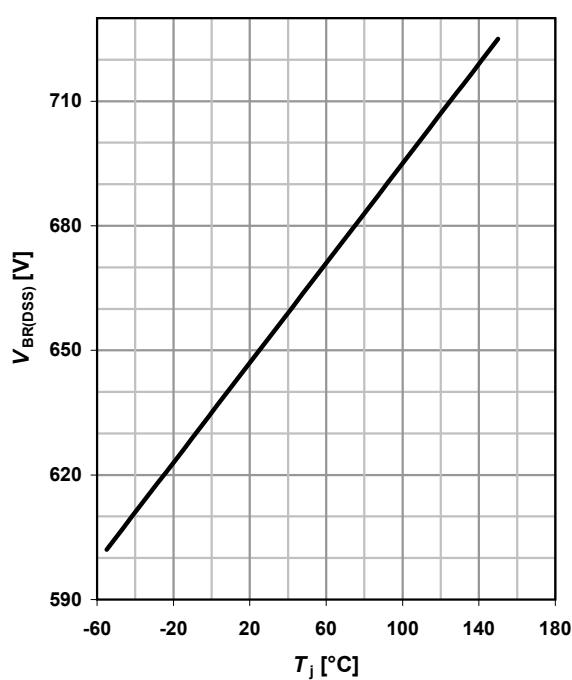
parameter:  $V_{GS}$ 

**6 Typ. drain-source on-state resistance**
 $R_{DS(on)} = f(I_D)$ ;  $T_j = 150 \text{ }^\circ\text{C}$ 

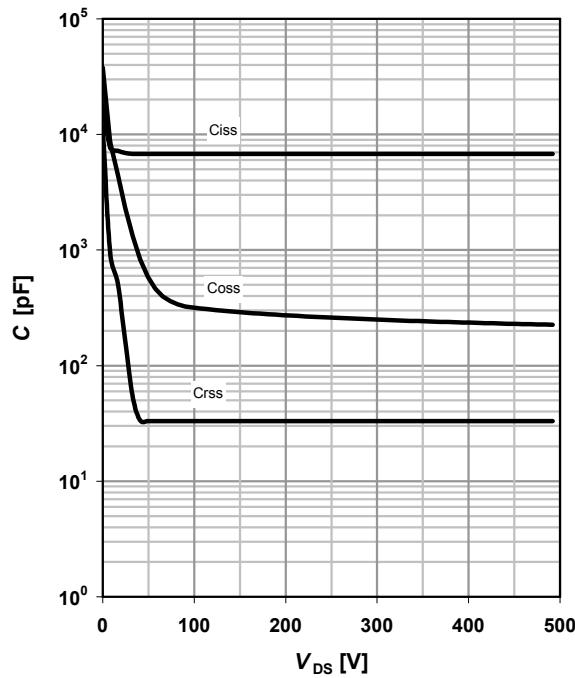
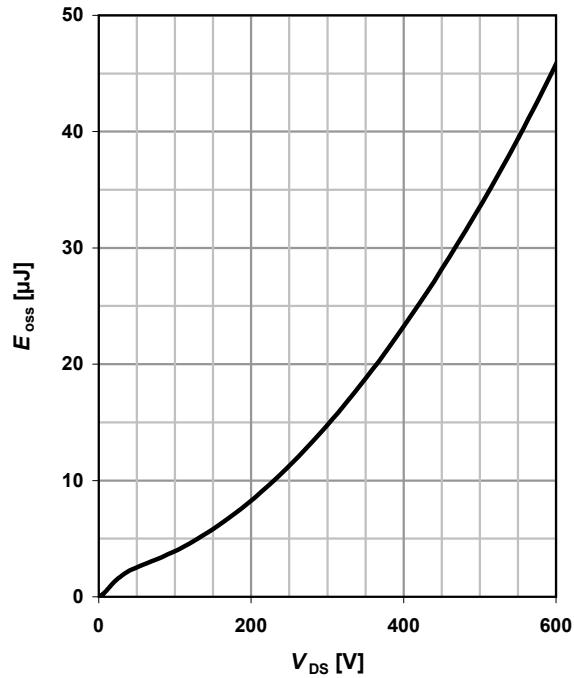
parameter:  $V_{GS}$ 

**7 Drain-source on-state resistance**
 $R_{DS(on)} = f(T_j)$ ;  $I_D = 30 \text{ A}$ ;  $V_{GS} = 10 \text{ V}$ 

**8 Typ. transfer characteristics**
 $I_D = f(V_{GS})$ ;  $|V_{DS}| > 2|I_D|R_{DS(on)max}$ 

parameter:  $T_j$ 


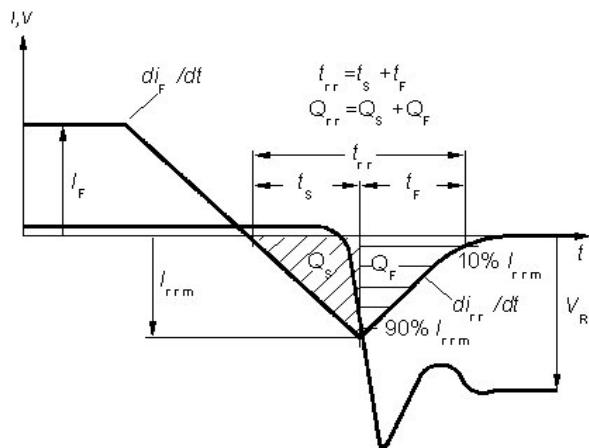
**9 Typ. gate charge**
 $V_{GS} = f(Q_{gate})$ ;  $I_D = 47 \text{ A}$  pulsed

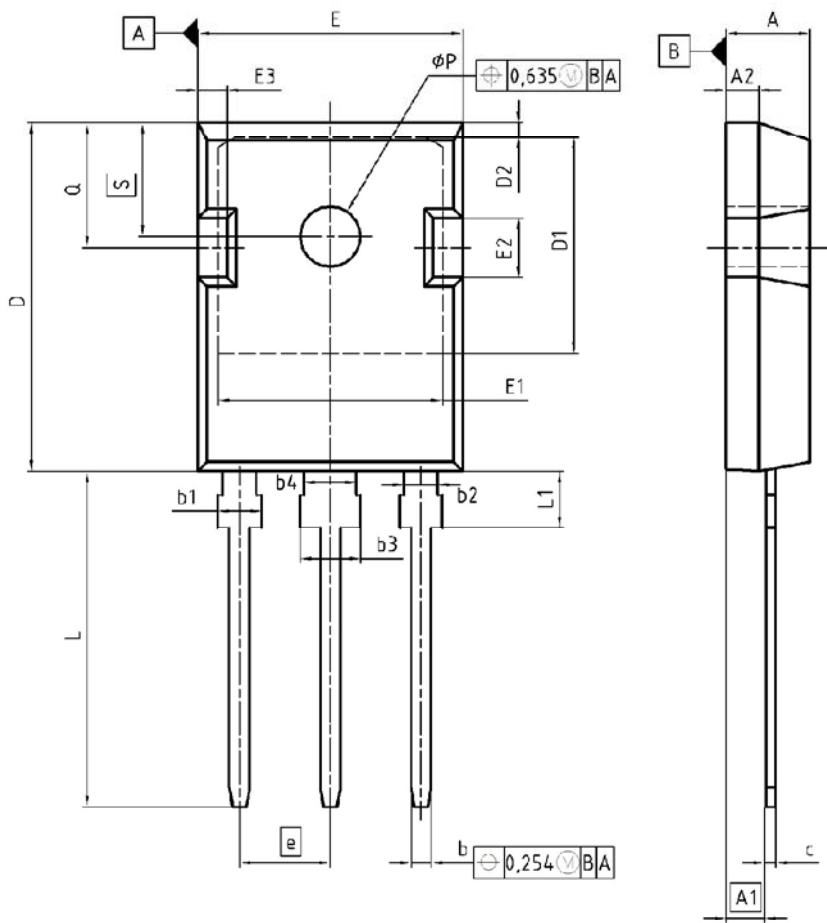
parameter:  $V_{DD}$ 

**10 Forward characteristics of reverse diode**
 $I_F = f(V_{SD})$ 

parameter:  $T_j$ 

**11 Avalanche energy**
 $E_{AS} = f(T_j)$ ;  $I_D = 3.5 \text{ A}$ ;  $V_{DD} = 50 \text{ V}$ 

**12 Drain-source breakdown voltage**
 $V_{BR(DSS)} = f(T_j)$ ;  $I_D = 0.25 \text{ mA}$ 


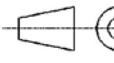
**13 Typ. capacitances**
 $C=f(V_{DS}); V_{GS}=0 \text{ V}; f=1 \text{ MHz}$ 

**14 Typ. Coss stored energy**
 $E_{oss}=f(V_{DS})$ 


## Definition of diode switching characteristics



**PG-T0-247-3-1: Outlines**


DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.90	5.16	0.193	0.203
A1	2.27	2.53	0.089	0.099
A2	1.85	2.11	0.073	0.083
b	1.07	1.33	0.042	0.052
b1	1.90	2.41	0.075	0.095
b2	1.90	2.16	0.075	0.085
b3	2.87	3.38	0.113	0.133
b4	2.87	3.13	0.113	0.123
c	0.55	0.68	0.022	0.027
D	20.82	21.10	0.820	0.831
D1	16.25	17.65	0.640	0.695
D2	1.05	1.35	0.041	0.053
E	15.70	16.03	0.618	0.631
E1	13.10	14.15	0.516	0.557
E2	3.68	5.10	0.145	0.201
E3	1.68	2.60	0.066	0.102
e	5.44		0.214	
N	3		3	
L	19.80	20.31	0.780	0.799
L1	4.17	4.47	0.164	0.176
$\phi P$	3.50	3.70	0.138	0.146
Q	5.49	6.00	0.216	0.236
S	6.04	6.30	0.238	0.248

DOCUMENT NO.	Z8B0003327
SCALE	0
0	5
5	7.5mm
EUROPEAN PROJECTION	
	
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